

Siting Regulations for Manure Storage Facilities

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Factsheet

ORDER NO. 09-061

AGDEX 720/538

NOVEMBER 2009

Replaces OMAFRA Factsheet 06-021, *Siting Regulations for Manure Storage Facilities*

INTRODUCTION

Animal manure is a good source of crop nutrients if properly managed and applied responsibly. But manure can become a contaminant if it comes into contact with surface or groundwater, or otherwise causes an adverse effect. Components of manure that can cause problems include:

- coliform bacteria and nitrate nitrogen, which can contaminate water supplies if allowed to run uncontrolled from storage areas and exercise yards
- phosphorus, which if allowed into a watercourse can promote algae growth, which in turn can use up oxygen in the stream, killing fish
- odours resulting from bacteria and other micro-organisms in stored manure that can bother neighbours

Ontario Regulation 267/03 under the Nutrient Management Act 2002 is intended to reduce the potential for this type of pollution. It regulates the location and construction of manure storage structures. This Factsheet examines location considerations involving surface water, wells and neighbouring homes.

Figure 1 shows one type of structure for containing liquid manure safely so it will not impact on surface or groundwater. Visit www.omafr.gov.on.ca for more information on construction standards for solid and liquid manure storage structures.

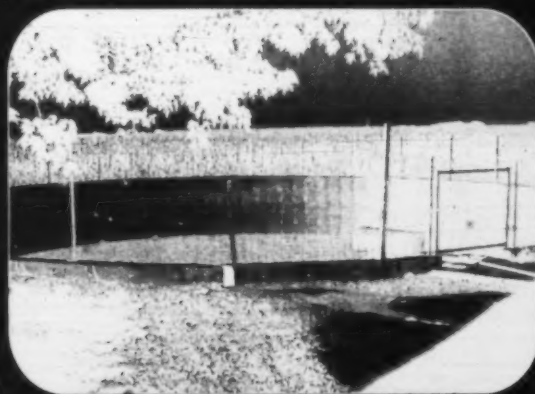


Figure 1. A reinforced concrete manure storage structure built to contain all waste nutrients from a livestock enterprise.

SETBACK DISTANCES FOR PERMANENT MANURE STORAGE STRUCTURES

The Regulation applies to operations required to have a nutrient management strategy (NMS) or a nutrient management plan (NMP). It details requirements for setbacks when constructing or expanding a permanent manure storage structure.

A properly located and constructed permanent manure storage facility will keep nutrients from reaching surface or groundwater. As well, the combination of a good soil management and cropping program can assure that these nutrients are absorbed by the soil at spreading time for subsequent crop uptake without risk to water quality. Adequate setback distances are one of the strategies addressed by the NMA Regulation.

MINIMUM DISTANCE TO WELLS

Contamination of water wells is a serious threat on any livestock farm. The three most practical steps to avoid this threat include:

- maintain well infrastructure in good condition (cap, casing, etc.)
- ensure proper setbacks between wells and possible contamination sources (See Table 1 for required manure storage separation distance)
- test well water for bacterial contamination several times per year

Table 1. Minimum Distance from Wells

| Type of well | O. Reg. 267/03, s. 63(1) | Comments |
|-----------------|--------------------------|--|
| Drilled | s. 63 (1) a | All manure storage structures must be a minimum of 15 m from a drilled well that has a depth of at least 15 m and a watertight casing to a depth of at least 6 m below ground level. |
| Municipal | s. 63 (1) b | All manure storage structures must be a minimum of 100 m from a municipal well. |
| All other wells | s. 63 (1) c and d | All manure storage structures must be a minimum of 30 m from any other well. |

MINIMUM DISTANCE TO FIELD DRAINS

Field drainage tiles near a manure storage structure are a potential pathway for manure leaks or spills to be transported to surface water. Subsurface tiles always outlet into ditches and/or drains that eventually empty into surface water.

- All manure storage structures must be a minimum of 15 m from all field drainage tiles or piped municipal drains.
[O. Reg. 267/03 s. 63(2), (5), (6)]
- When building a permanent nutrient storage facility, locate and remove all existing field drains within the area bounded by the perimeter of the facility, plus 15 m.
- Redesign the existing drainage system to direct the flow away from or around the storage facility.
- If a drainage system is required within 15 m of a permanent nutrient storage facility, any water collected by these drains must be discharged to a

treatment system, or the drains must be equipped with an observation catch basin and shut-off valve.

The observation catch basin and its shut off valve allows an operator to inspect for contamination, contain liquid and take remedial action if contamination is detected.

MINIMUM DISTANCE FROM SURFACE WATER

All permanent nutrient storage facilities must be located so that they have a flow path length of at least 50 m to the top of the bank of the nearest surface water. [O. Reg. 267/03 s. 63(3)]

In the Regulation, "surface water" is defined as:

- a natural or artificial channel that carries water continuously throughout the year, or intermittently, and does not have established vegetation within the bed of the channel except vegetation dominated by plant communities that require or prefer continuous presence of water or continuously saturated soil for their survival
- a lake, reservoir, pond, or sinkhole
- a wetland, such as a swamp, marsh, bog or fen, but not land that is being used for agricultural purposes that no longer exhibits wetland characteristics, if the wetland:
 - is seasonally or permanent covered by shallow water or has the water close to the surface of the ground, and
 - has hydric soils and vegetation dominated by hydrophytic or water-tolerant plants

The following are **not** surface water for the purposes of the Regulation:

- grassed waterways
- temporary channels for surface drainage, such as furrows or shallow channels that can be tilled and driven through
- rock chutes and spillways
- roadside ditches that do not contain a continuous or intermittent stream
- temporarily ponded areas that are normally farmed
- dugout ponds
- artificial bodies of water intended for the storage, treatment or recirculation of runoff from farm-animal yards and manure storages

"Flow path", in relation to a facility, site, outdoor confinement area or temporary storage area, means a surface channel or depression that conducts liquids away from the facility, site or area.

[O. Reg. 267/03, s. (1)]

A facility may use a permanently vegetated flow path as a runoff management system if it:

- has been constructed in accordance with MSTOR* or equivalent
- has a floor area of no more than 300 m²
- has a minimum of 75 per cent of its perimeter area contained by walls that are at least 1 m high
- is used to store materials that contain no less than 30 per cent dry matter
- has been constructed with natural or manufactured devices capable of diverting up-slope water away from the facility

Vegetated Flow Path

- The vegetated flow path must be located on at least 0.5 m-deep soil and not located within 3 m of a field tile drain, 100 m of a municipal well, 15 m of a drilled well or 30 m of any other well to prevent the possibility of water contamination.
- The minimum length of vegetated flow path to surface water and all tile inlets must be increased to 150 m for a solid manure storage handling manure with a lower dry matter content of between 30 per cent to 50 per cent.
- For manure with a dry matter content of 50 per cent or more the vegetated flow path only needs to be 50 m from the surface water. [O. Reg. 267/03 s. 81(5)]
- All permanent nutrient storage facilities must be located above the 1-in-100-year flood line established by the municipality or by the local conservation authority. [O. Reg. 267/03, s. 63(4)]

Check with the municipality or local conservation authority if the site is close to a river or stream or to verify flood lines.

SITE REQUIREMENTS FOR THE PERMANENT STORAGE FACILITY

A professional engineer or geoscientist must carry out a geotechnical investigation of the site prior to constructing or expanding a permanent liquid nutrient storage facility.

If the structure will be built of concrete or steel, they need to identify soil types and presence of an aquifer or bedrock within 1.5 m below excavation.

For earthen structures, a deeper investigation, extending 2.5 m below the excavation is needed. This investigation requires the excavation of at least one test hole per 1,000 m² of the ground floor area of the proposed storage facility. The test holes must be located in the zone that is at least 3 m and not more than 10 m from the perimeter footprint of the proposed facility. [O. Reg. 267/03, s. 64–68]

This investigation is to verify that there is a minimum depth of soil between the bottom of the proposed storage and the uppermost bedrock layer or water table. The type of soil must also be identified and analyzed to determine if it has sufficient clay content or can be classified as hydraulically secure to eliminate the need for a secondary liner.

Two Layers of Protection

The Regulation requires two layers of protection to minimize any leakage/seepage from liquid manure storage reaching groundwater: first layer is the structure (concrete, steel, etc.); the second is hydraulically secure soil or a liner.

A "hydraulically secure soil" means natural soil that is consistent in nature and able to meet a maximum saturated hydraulic conductivity of 1×10^{-8} m/sec. — in other words, almost impervious.

A "liner" for manure storage includes a geomembrane liner, a geosynthetic clay liner and a compacted soil liner that is placed under the floor and footings of the facility. This liner extends up the sides to a level equal with the top of the ground surface to provide an additional barrier against nutrient movement from the storage.

* A manure storage sizing component of OMAFRA's NMAN software to help develop nutrient management strategies or plans.

Example

A farmer wishes to construct a new dairy free-stall barn and milking parlour for 200 milking cows and an open-top concrete manure tank to collect and store the manure from the alley scrapers and wash water from the parlour.

In order to meet the Regulation under the NMA, the new, fully reinforced concrete permanent liquid nutrient storage facility (the tank) for this operation must be at least:

- 50 m from any surface water
- 15 m from all field tiles
- 15 m from a drilled well, 100 m from a municipal well, 30 m from all other wells
- above the 1-in-100-year flood line mapped by the municipality or conservation authority

At the desired storage site, a professional engineer or geoscientist will conduct a geotechnical investigation of the soil to a depth of 1.5 m below the proposed site. This investigation must confirm there is at least 0.5 m of hydraulically secure soil or 1.0 m of soil with at least 10 per cent clay below the site. If not, a liner option must be considered.

Temporary Manure Storage Sites

Agriculture source materials, as long as they are not liquid nutrients, can be temporarily stored at a field site for later spreading if the site meets the criteria outlined in O. Reg. 267/03, s. 82–86 and does not create an odour nuisance for neighbours. A number of minimum distance separation conditions must be met to use this storage option.

Site Location:

- at least 45 m from a drilled well with watertight casing
- at least 100 m from a municipal well
- at least 90 m from any other well
- must be located at an elevation above the 1-in-100-year flood line established by the municipality or local conservation authority
- if the site is used for storing agricultural source materials, at least 125 m from a single residence and 250 m from a residential area, community or institutional use [O. Reg. 267/03, s. 83(2)]

Site Conditions:

- minimum depth of unconsolidated soil to bedrock, under the site and within 3 m of the side of the site, to be at least 0.3 m
- minimum depth of soil above the water table, under the site and within 3 m of the side of the site, to be at least 0.9 m
- no storage allowed on soils with a rapid infiltration rate. A coarse-textured, gravelly soil would be a typical example of an unsuitable location

- must not have a slope greater than 3 per cent
- there must be a flow path away from the storage site that is at least 50 m to the nearest surface water or tile inlets, and is located at least 0.3 m above bedrock [O. Reg. 267/03 s. 83(1)]

The time manure can be stored at a temporary site is determined by assessing 10 factors related to the material properties, site conditions and storage management. The longest maximum storage period is 300 days, with maximums of between 30–150 days being more typical. [See O. Reg. 267/03, s. 85 for full details regarding specific storage periods or contact an OMAFRA representative.]

MINIMUM SITING CRITERIA FOR PERMANENT MANURE STORAGE STRUCTURES

To avoid odour complaints from neighbours and other neighbouring land uses follow the siting formula called the Minimum Distance Separation (MDS).

While MDS calculations are not required by the NMA Regulation many local municipalities do require them. The information below, which includes MDS, is provided as an overview of factors to consider when building.

Table 2. Minimum Siting Criteria for Manure Storage Structures

| Surrounding Feature | Permanent Nutrient Storage Facility | Temporary Field Storage |
|-----------------------------------|-------------------------------------|-------------------------------------|
| Surface water | 50 m | 50 m |
| Field drainage tiles | 15 m | contingency plan required |
| Drilled wells (watertight casing) | 15 m | 45 m |
| Municipal wells | 100 m | 100 m |
| All other wells | 30 m | 90 m |
| Flood plain restriction | not within 1-in-100-year flood line | not within 1-in-100-year flood line |
| Nearest neighbouring dwelling | MDSII calculation ¹ | 125 m |
| Nearest residential area | MDSII calculation ¹ | 250 m |

¹ See minimum distance separation information that follows.

The required separation distance varies according to a number of criteria including type of livestock, size of farm operation, type of manure system and the neighbouring land use. See OMAFRA Publication 707, *Minimum Distance Separation (MDS) Formulae Implementation Guidelines*.

Contact local municipal offices for a calculation of the required minimum separation distances for any proposed manure storage or new livestock building.

To finalize the location of any new manure storage facility prepare a schematic, scaled drawing of the farmstead. The storage area will need to be accessed by large equipment and provide unrestricted traffic flow for hauling manure. Always consider future growth — build in a location that will not obstruct or limit barn expansion. Figure 2 shows typical separation distances to consider when planning a new manure storage structure.

A well maintained farmstead and reasonable consideration of the neighbours' ability to enjoy their property could have a significant bearing on the community's attitude toward your operation. Prevailing summer breezes can carry odours from the manure storage area and may annoy downwind neighbours. Consider visual screening of manure storages. Often a tree windbreak or other visual screening can aesthetically benefit both the farmstead and neighbouring properties.

Ensure that safety measures are in place in the unlikely chance of a spill or other breakdown of the manure storage structure or handling system.

A good storage location should provide space and topography suitable for secondary containment. All nutrient management plans require the preparation of a spills contingency plan to address this type of potential accident. [Nutrient Management Protocol, p. 5, s. 5.2.5, no. 10 and p. 11, s 11.1–11.5]

Contingency Plans

A permanent nutrient storage facility is expected to contain all nutrients until field spreading is appropriate (or the nutrients are otherwise removed from the operation). While no one plans to have manure runoff leak, farm operators must be prepared for this situation.

Ensure there is a contingency plan to contain and treat this material to prevent water pollution. An earthen berm to block runoff from entering a stream is one option to consider.

ADDITIONAL INFORMATION

OMAFRA Publications

OMAFRA Publication 29, *Drainage Guide for Ontario*

OMAFRA Publication 707 *Minimum Distance Separation Implementation Guidelines*

OMAFRA Publication 824, *Guide to Agricultural Land Use*

Best Management Practices Book

BMP 07, *Water Management*

BMP 14, *Nutrient Management Planning*

BMP 15, *Buffer Strips*

BMP 165, *Manure Management*

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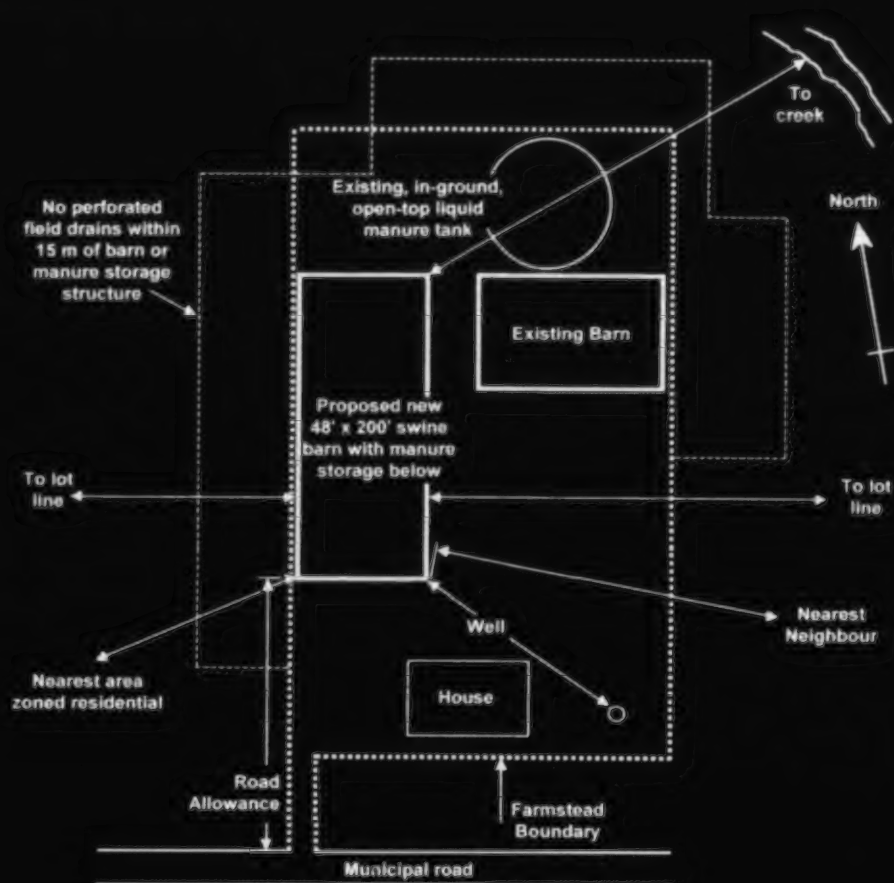


Figure 2. Property sketch showing separation distances for a proposed permanent manure storage.

FOR YOUR NOTES



POD
ISSN 1198-712X
Également disponible en français
(Commande n° 09-062)

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